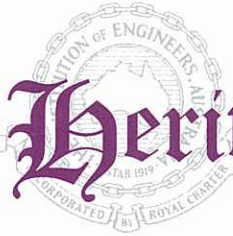


# Engineering Heritage Australia



Newsletter of the National Committee on Engineering Heritage  
The Institution of Engineers, Australia

No. 7

September 1997

## Come to Ballarat

In 1998, the 9th National Conference on Engineering Heritage will be held in Ballarat, Victoria, from Sunday 15 to Wednesday 18 of March. The theme of the conference will be the "*Wealth of a Nation*" which arose from the gold mining, manufacturing, and infrastructure developments of the 19th century.

The conference organisers have arranged a varied programme concentrating on aspects of national wealth creation through engineering endeavours and achievements, particularly those in relation to the mineral discoveries of the 19th century.

Delegates to the conference will have the chance to inspect the various gold mining and infrastructure developments in the Golden Triangle of Victoria which contributed to the *Wealth of a Nation*. Included in this is a planned pre-conference tour of the Golden Triangle from Melbourne to Bendigo, Maryborough, and Ballarat.

If enough delegates attend, this will be a rail tour of the area conducted in conjunction with Steam Rail Victoria.

The conference organisers have also invited the kindred professional organisations, the Australasian Institute of Mining and Metallurgy and the Royal Australian Institute of Architects, to participate in the conference. It is hoped by doing this, to link the engineering, mining, and architectural aspects of 19th century wealth creation.

A varied programme for partners has been organised, with visits to nearby places of interests, the botanical gardens in Ballarat, and the Ballarat Fine Art Gallery, one of the premier art galleries of Australian provincial cities.

The venue for the conference will be the historic City of Ballarat Town Hall, with other activities being held at the Ballarat Memorial Theatre, the Fine Art Gallery, and of course, Sovereign Hill Gold Mining Township.

Post-conference visits to modern operating gold mines in the district have also been arranged.

The Institution of Engineers,  
Australia

### 9TH NATIONAL CONFERENCE ON ENGINEERING HERITAGE

15 - 18 March 1998

### WEALTH OF A NATION

#### FEATURES

Development of Gold Mining  
Victorian Architecture  
Operating Steam Plant  
19th Century Infrastructure

#### OTHER ATTRACTIONS

Eureka Stockade  
Botanical Gardens  
Begonia Festival  
Sovereign Hill  
Tramway Museum  
Spa Centre

#### Pre-Conference Tour

Victoria's "*Golden Triangle*"

Melbourne - Bendigo - Maryborough -  
Ballarat

Historic bridges, Quartz mining,  
Manufacturing, Railways and tramways,  
Buildings and structures, Deep Lead  
mining

For further information contact:  
Conference Organisers

PO Box 53, Creswick VIC 3363

Tele: (03) 5327 9131(B),

(03) 5345556(AH), Fax: (03) 5327 9137

Email: [rtin@eureka.ballarat.edu.au](mailto:rtin@eureka.ballarat.edu.au)

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See us also at: <http://www.ieaust.org.au>



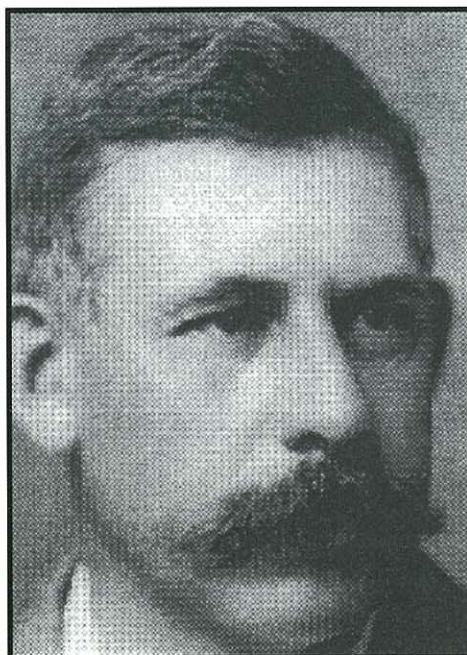
# An Early Hydro-Electric Scheme

The first municipal-organised electric street lighting in New South Wales was switched on in Tamworth in 1888. Whilst public lighting existed in 1889 in Penrith, Redfern and other areas outside the City of Sydney, Sydney's electric street lighting system was only switched on on 8 July 1904 by the Lady Mayoress.

Jenolan Caves even beat Sydney in the electric lighting stakes, when a Leffel hydro-electric turbine was installed in 1889 to light the Lucas Cave.

The towns and mines of Hillgrove also preceded Sydney. Their electricity supply was constructed during 1893 - 94 at a cost of 40,000 pounds, and commenced operation on 13 September 1894.

In 1892 the Hillgrove and Armidale Water Power Electric Company had been formed to generate hydro-electric power from the Gara River. Following a petition, Parliament passed a Bill on 10 March 1893, to allow the necessary diversion of water. Professor Richard Threlfall of Sydney University and a Consulting Electrical Engineer, was commissioned to design the scheme.



*Professor Richard Threlfall*

He chose a three wire direct current (DC) system of 1600 volts, rather than alternating current (AC). DC was used on all early power installations, but compared to AC, presented problems in transmission over distance.

Threlfall's success in transmitting DC over the distance from the Gara generators to Hillgrove was a world first. However, by the end of the century, AC had displaced DC worldwide.

## Terowie Station Added to State Register

### STOP PRESS

Parkes Radio Telescope has been awarded a National Engineering Landmark, by IEAust President Elect Barry Grear, and Hon Peter McGauran, Minister for Science and Technology.

More details in next issue.

Terowie was a break of gauge station on the line from Adelaide to Peterborough, Quorn, Broken Hill, and, at one time, Oodnadatta and Perth. The station and surrounds have recently been added to the South Australian State Heritage Register.

Most people have heard of General Douglas McArthur and his famous remark, "I shall return", made during World War II. But how many would know he was standing on the platform at Terowie when he made it?

Terowie is 225 km north of Adelaide and was chosen as the point for a change of gauge so that farm produce

from south of Terowie could be railed to Port Adelaide on the broad gauge, while that from areas to the north could be railed to Port Pirie on the narrow gauge. The broad gauge line was opened on 14 December 1880 and the narrow gauge line onwards to Peterborough, on 11 May 1881.

When the Trans-Australian Railway was built, all trains between Perth and the Eastern states passed through Terowie. As well as a substantial stone station building, there was an equally substantial Refreshment Room which served meals while passengers were waiting for luggage and mail to be transferred.

# Engineers Fight for Their Heritage

The following letter appeared recently in the Sydney Morning Herald. Fortunately the developers of Walsh Bay listened and the current proposals are sympathetic to the retention of this important engineering heritage.

*The proposal by Sydney's visiting architect, M Philippe Robert, to retain Piers 8 - 9 at Walsh Bay ("French twist to Walsh Bay plan" 7 February 1997) raises two interesting issues. Firstly, it is a recognition that, from an engineering heritage point of view, this pier is certainly the most important of the set. It contains an almost complete installation of hydraulically - operated wool - handling equipment, which is thought to be almost in working order - there is nothing like it in Sydney, nor probably in the nation. This is an installation of quite outstanding significance that must at all costs be retained in the location for which it was designed.*

*Secondly, the proposal emphasises that, after all, the structure of this pier has the potential to be re-used; there is no justification whatsoever for the argument that the structure is in such poor condition that it must be removed so that some other (more profitable) building can be put in its place. We have long known that this was a specious argument, and this distinguished visitor has confirmed it.*

*But it is important to remember that it is the complete set of four wharves - the precinct - that has been placed on the Register of the National Estate. To remove any one of these buildings, even pier 6 - 7, would destroy the heritage integrity of the set. At Walsh Bay, we have an engineering heritage precinct which is of world significance, but its importance depends upon its completeness. We cannot lose any of these wharves.*

**KEN WYATT**  
Chairman, Sydney Division  
Heritage Committee

## They Do Listen to Us

Two members of the National Committee on Engineering Heritage attended one of the workshops conducted by the Committee of Review - Commonwealth Owned Heritage Properties, in Brisbane in October 1995.

Comments made by Bill Oliver and Ray Whitmore were duly included in the report by the Committee, completed in October 1996 and released by the Minister for Communications and the Arts, Senator Richard Alston on 12 February 1997.

Copies of the report may be requested from the Department on 1800 064 048. The excellently compiled report was written by Jane Lennon, a corresponding member of the Queensland Division Engineering Heritage Panel.



# Two New Books

## ***Between Wind and Water***

by Dr Lenore Coltheart, is the latest in a series of books on the role played by public works in the history of New South Wales.

Public architecture, railway, road and bridge building, and harbours and river engineering were the responsibility of the colonial Department of Public Works. Separate core organisations emerged in the business of providing design, construction, operations and services in both public and commercial sectors.

*Between Wind and Water* draws on the politics and history of Australia's ports, on the local history of coastal communities,

and on the substantial records of the New South Wales Department of Public Works and Services and the Department of Land and Water Conservation New South Wales, to show the significance of our engineering heritage and waterways management in understanding past and present, and the place of the coast in Australian culture.

From the building of the first wharves and dockyard in Sydney Cove to the beach improvement and fishing ports programmes and the waterway planning studies of the 1970s and 1980s, *Between Wind and Water* traces the history of the ports and coastal waterways of New South Wales.

To colonial engineers "between wind and water" meant the vulnerable low-water to high-water section of wharf timbers. Dr Coltheart has used this idea to signify all the energies making the history of a maritime state, including our own place in the shaping of waterway and coastline.

The book was launched on 7 April at the National Maritime Museum by the Hon Carl Scully, MP, Minister for Public Works and Services and Minister for Ports. Published by Hale and Iremonger, it is available from commercial bookstores in hard cover at \$34.95.

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## ***Australian's Uranium Opportunities - How Her Scientists and Engineers Tried to Bring Her into the Nuclear Age but were Stymied by Politics***

This book by Keith Alder is very much a personal account by one who was deeply involved in the rise and fall of the Australian Atomic Energy Commission (AAEC).

Whilst it is not a full history of the AAEC, it reveals the thinking behind the Commission's research programmes and its major projects, particularly its work on uranium as a fuel, and its efforts to bring uranium processing industries to Australia. The author takes issue with the oft quoted opinion that "*the Commission lost its way*", which originated largely from media

coverage of its changing research objectives and from the ill-fated Jervis Bay Power Station of 1969-70. His message is that much of what has been written about the AAEC is wrong, and has been based on sensational journalism influenced by a vociferous anti-nuclear minority.

It is not a happy story. The upshot has been waste of repeated opportunities for the development of major industries based on our uranium resources, and along the way, waste of research resources and results, all caused by the shifting sands of government policies.

Politics and politicians had disastrous effects on the AAEC, its programmes and its aspirations. Whether one agrees or not with the need for a uranium-based industry, this is an

important historical account of what happened and why, by one who (as he says) "*was there, and for much of the time, running the show*".

The author concludes with the view that the causes of the problems are still here in Australia, in public and political attitudes.

Copies of the book (soft cover) are available from Pauline M Alder, 2 Eulbertie Avenue, Warrawee NSW 1074 at \$20 each including postage to anywhere in the world.

Keith Alder joined the AAEC in 1954 and retired in 1982 after seven years as its General Manager. His story has been recorded as part of the Sydney Engineering Heritage Committee's Oral History Programme.



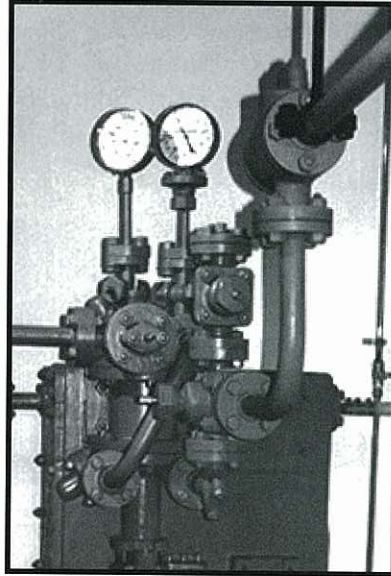
# Recent Plaquing

## HISTORIC MARKER FOR REFRIGERATION PLANT

South Australia's seventh Historic Engineering Marker was awarded to the refrigeration plant at Urrbrae House.

Urrbrae House is the former family home of pastoral pioneer Peter Waite, who arrived in Australia in 1859 joining his brother on his property near Terowie in South Australia. In the ensuing years his fortunes prospered and he eventually owned extensive interests in pastoral properties.

In 1874 Peter Waite purchased "Urrbrae". Fifteen years after his purchase, Waite decided to rebuild the existing home and, by the end of 1889, a two storey mansion of 35 rooms had been erected. The new home reflected his innovative outlook and featured such novelties



as a tiled roof and a 32 volt DC lighting system supplied from a large bank of batteries.

The refrigeration plant was installed in 1895 by Wildridge and Sinclair of Pitt Street Sydney, using a compressor built by the Linde British Refrigeration Company of London. Dr Carl Linde had patented a new compression process using liquid anhydrous ammonia in 1873, and in 1876 produced the first commercial machine operating on this system. The unit at Urrbrae House is the first adaptation of commercial refrigeration technology for domestic use in Australia (although Waite's house, with its extensive rooms and facilities, including a ballroom and musicians' gallery, is hardly typical of South Australian residences).

## WORLD'S OLDEST MCNAUGHTED ENGINE

On 8 April 1997, an 1854 McNaught beam engine was declared an Historic Engineering Marker, in a ceremony at the Hobart Institute of TAFE. The plaque was unveiled by the Deputy Premier of Tasmania, Mrs Sue Napier.

The engine was built by A and W Smith and Company of Paisley near Glasgow. After a century of working, it was removed from Risby's Mill in 1955 and then stored by the Department of Main Roads until being placed on display in 1990, at the Hobart Technical College (now the Institute of TAFE).

The McNaught Compound Engine weighs some 25 tonnes, with the flywheel, which is 3.7 metres in diameter, alone weighing 9 tonnes. The placement of the two double acting cylinders - one on either side of the central column - was the subject of a 15 year patent taken out in 1845 by William McNaught.

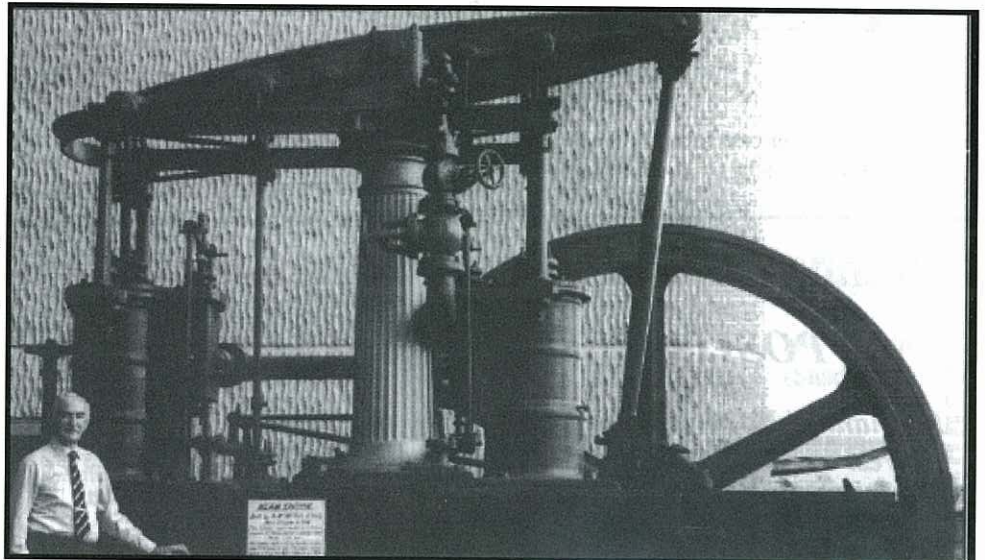
Most early compound engines had the two cylinders positioned on the same side of the column. However, the addition of a high pressure

cylinder to an engine designed for low pressure use, often caused oversteering of the beam. McNaught's arrangement avoided this problem. The engine also incorporates the parallel link motion patented by James Watt in 1784.

When the records of boiler inspections were commenced in 1885, the engine was operating in Henry Clark and Company's sawmill in Collins Street, Hobart. However, who imported it and

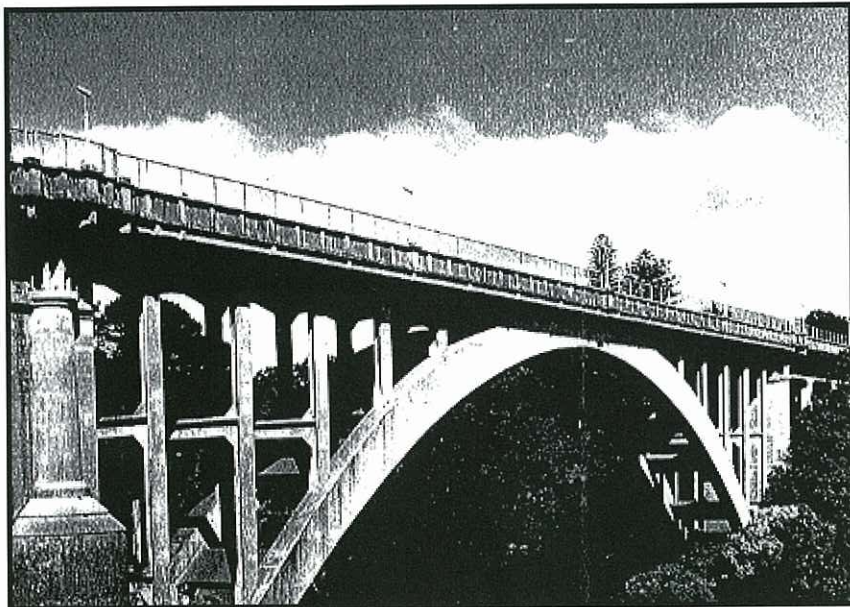
when remains uncertain. It could have been Alexander Clark (Henry's father) who set up an engineering business in Hobart in 1838.

Overseas enquiries indicated the Hobart engine could be claimed to be the world's oldest extant McNaughted engine. This claim was confirmed in May 1994 by the Newcomen Society of London, the world's leading authority on such matters. (The oldest existing engine of this type in Britain, was built in 1865).





# Auckland's Grafton Bridge



There is a bridge between engineering heritage in Australia and that in New Zealand, in the form of Auckland's Grafton Bridge. It has a special pride of place in New Zealand, but was designed and built by the Australian company, Ferro-Concrete Company of Australasia Limited.

It took two and a half years to build, being opened in April 1910 and was claimed to be the biggest span, reinforced concrete arch bridge in the world at that time. The twin three pinned arches spanned 97.6 m rising 25.6 m above the abutments and to a height of 43.3 m above the valley floor. It was certainly a pioneering structure, being very early reinforced concrete, showing great engineering enterprise and brilliance of design. Now in 1997 it is still a vital link in the street system of NZ's largest city, carrying a solid stream of car and van traffic, but heavy transport is excluded.

Two tenders were received, one in steel for £28,730 and the second for a reinforced concrete bridge for £31,918. The concrete design was accepted, because the maintenance costs would be much lower.

For the Ferro-Concrete Company, Mr R F Moore was Chief Engineer, and Mr Rosegger, the Chief Assistant Engineer who made the calculations. The timber falsework was massive and consisted of 400,000 super feet (943 cu.m) of West Australian jarrah and Oregon pine. "The height of the moulds was adjusted most accurately by 160 bottle jacks, which performed their work more effectively than the sand boxes more generally employed".

Concrete was made of beach shingle, 6:1 mix using local cement.

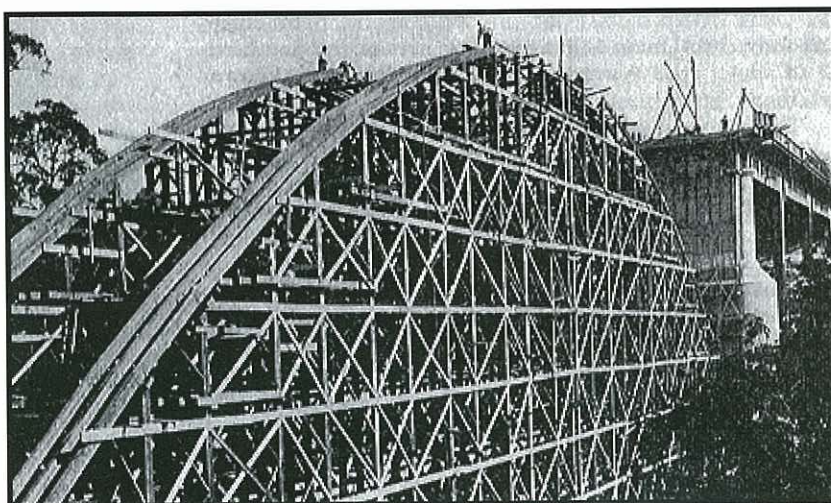
Preliminary tests of concrete were made by Professor Warren of Sydney and a design strength fixed at 500 lbs

per square inch (3.4 MPa).

All did not go well for the Ferro-Concrete Company. The site was difficult, being a steep-sided bush clad valley and there was trouble with the complexity of the formwork and getting it in place. Late in the contract the company could not continue, was declared bankrupt and the job was completed by Council labour. The final cost was £35,000, being an over-run of only £3,000. The arch design was submitted to Professor Moersch of Germany and a clause in the contract stipulated that "... no progress payments should be made on the arch span till it is completed and tested". This no doubt caused the downfall of the company.

Load tests were carried out on the newly completed bridge. Firstly one half of the arch span was loaded with 297 tonnes of roading aggregate to give an equivalent load of 5.4 kPa. The deflection was measured as 2 mm. "In all cases the results were extremely satisfactory..."

The expectation that maintenance would be very low was born out by experience. "...the record of maintenance on the structure over a quarter of a century was excellent, being almost nil,..."

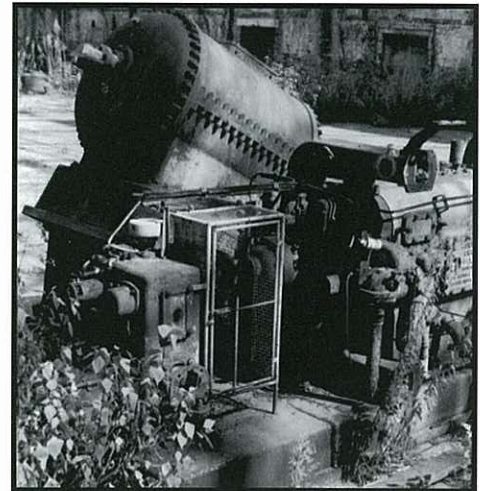




# Recovered Ruins at Mortlake

A unique and historic machine belonging to Sydney's gas company AGL has just found a new home at Gunnedah, New South Wales. The machine is a Michell crankless gas booster coupled to a crankless gas engine and a crankless starting engine. It was one of two originally installed in 1928 at AGL's Kingsgrove booster station. They operated continuously until the booster station became redundant with the introduction of natural gas. One of the machines was given to Sydney's Powerhouse Museum, but is not on display. The other one was stored at AGL's Mortlake site, but has just been given by AGL to the Gunnedah Rural Museum, which already has a collection of large machinery, much of it in operating condition. The AGL machines are briefly described in a letter from A J Treble

published in the IEAust Mechanical Engineering Transactions AGM Michell 20th Anniversary Memorial Issue in 1979. AGM Michell, the designer of the machines, is best known for his invention of the tilting pad thrust bearing, which is now used universally in large ships and in many other machines such as steam and water turbines. Michell subsequently devoted much of his career to development of the crankless engine and his company. The Crankless Engine Company in the 1920s built over 40 prototypes for engines, compressors, blowers and pumps. AGL had around ten crankless gas boosters, one a small prototype built in Melbourne, the rest built in



England. Two of these, the ones still surviving, were coupled to Michell designed crankless gas engines also built in England. Only a very few of these machines were ever built and it is likely that the two preserved in New South Wales are the only survivors. There are a few other Michell crankless machines preserved by museums, including a crankless diesel aero engine at the Smithsonian Institute in Washington DC.

## Securing Engineering Heritage - Stringing it Together

The photograph below shows a piece of engineering heritage that nearly got away. The hulk, lying on the flood plain of the Brisbane River at Moggill, is probably a former Moggill Ferry which used to connect Ipswich and Brisbane across the River, about 1250 metres downstream of the confluence of the Bremer and Brisbane Rivers. It shifted during the minor Brisbane River flood in May 1996.

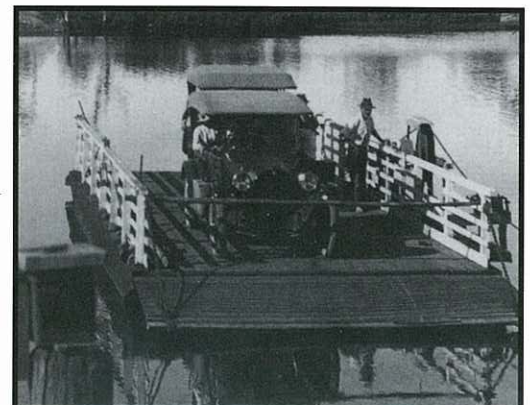


The second photograph, one of several distributed as a handout by the Queensland Department of Main Roads shows a similar ferry in operation across

the Coomera River. The date of the photograph is not precisely known. Research by the Queensland Division Heritage Panel has established that the latest it is likely to have been is 14 June 1930, when the Coomera River Bridge, completed by M R Hornibrook Ltd at a cost of £27,000, was opened. G O Boulton, Chief Engineer of M R Hornibrook, made reference to the bridge and its cost in his application for grade transfer from Associate Member to Member, dated 25 June 1934. The bridge is still in services. Originally on what was described by Boulton as the Main South Coast Road, it now carries two southbound lanes on the Pacific Highway. Composite action between steel structure and concrete deck was built in but not designed, making it the first of this type in Queensland (and possibly in Australia). Boulton was to become Chairman of Queensland Division in 1939, and retired

as Chief Engineer of M R Hornibrook in 1960.

Boulton is one of several eminent engineers being considered for inclusion in a second volume of *Eminent Queensland Engineers*. Volume I, published in 1984, is increasingly sought after by historians, Australia-wide and overseas. Volume I covers the careers of 34 engineers prominent in Queensland and, in some instances, in other parts of Australia. It is available for \$10, postage paid to anywhere in Australia, from Queensland Division.





# It Cannot be Done!!!



It was done, and in fact, done twice!

Firstly, the crane WAS built in 1925 and secondly, the crane WAS saved in 1996.

Seventy-two years ago... in 1925... it was said that the new cranes required by the Fremantle Harbour Board in Western Australia could not be built locally.

An order to build four of these patent folding-lever type luffing cranes, designed by Messrs Babcock and Wilcox, was placed with the Western Australian State Implement and Engineering Works which were managed by an Australian engineer named Frank Shaw.

These cranes were required because the new type of mail steamers that had started to operate in those days had a greater breadth of beam and an increased height above water which put them outside the reach of the existing cranes.

These four cranes originally operated along Victoria Quay on railway tracks with a gauge of 23 feet or 7 metres.

They weighed about 65 tonnes and were carried on cast steel wheels, shod with forged steel tyres.

Each crane was able to lift a load of some 3 tonnes at a radius of about 20 metres.

In about 1971, two of these cranes were relocated on either side of the slipway at the western end of Victoria Quay, and operated by the "Swan Dock" Company.

Now, after a further 26 years of service, they have at last been retired, as the Swan Dock Company has a requirement for two cranes with an even greater reach.

One of these cranes has now been finally located at the Eastern End of the relocated "E" Shed (now a general market) at Victoria Quay and has a guaranteed life of at least another 42 years.

You may be interested to know that a recent check of all the other Port Authorities around Australia has shown that Hobart has a 20 tonne fixed beam steam crane that was built in 1899, last used in 1965 and is now on display in Constitution Dock.

Hobart also have a couple of 100 year-old two tonne hand-operated cranes still in use.

Geelong has only one vintage luffing crane still in use whilst the Royal Australian Navy at Fleet Base East in Sydney Harbour still operates a 250 tonne hammerhead crane which has been downgraded to 170 tonne capacity.

## HELP WANTED

The University of Sydney historical archaeology project on the Overland Telegraph would be pleased to hear from or about anyone with expertise / knowledge in the fields of old batteries and insulators.  
Contact: Judy Birmingham  
(02) 9351 6794

## ERRATUM

In last issue Enoggera Dam was attributed to A B Brady. Prof. Ray Whitmore points out that the designer was in fact Joseph Brady.